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Some Factors Affecting the Growth of Grain Elevators in South Dakota

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SOME FACTORS AFFECTING THE GROWTH OF GRAIN ELEVATORS IN SOUTH DAKOTA

BY

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CHAPTER I

STATEMENT OF THE PROBLEM AND JUSTIFICATION

The grain elevator industry in South Dakota is currently undergoing considerable change. Small, inefficient elevators are being replaced with larger, more mechanized units. In South Dakota in 1960, there were 533 elevator companies in 368 towns[1], but by 1968 only 450 elevator companies survived in 345 towns.[2] An elevator company includes all the facilities and businesses that are under one management. Throughout this study elevator companies will be referred to as elevators.

A large number of grain elevators handle farm supplies in addition to their grain business. The sale of farm supplies has grown very rapidly in this country. Cost of purchased United States farm production items, except labor, farm real estate, and machinery, rose by 36.8 percent in the ten year period from 1958 to 1968.[3] In this same ten year period, South Dakota farm production expenses rose 75.7 percent.[4] These increases reflect inflation in part, but other

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[1]Farmers Elevator Association of South Dakota, 1960 Directory of the South Dakota Grain Elevators, Aberdeen, South Dakota.

[2]Farmers Elevator Association of South Dakota, 1968 Directory of the South Dakota Grain Elevators, Aberdeen, South Dakota.

[3]United States Department of Agriculture, Handbook of Agricultural Charts 1968, Agriculture Handbook no. 359, November 1968.

[4]South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture, 1958, p. 50, and South Dakota Agriculture, 1968, p. 58, Sioux Falls, South Dakota.

reasons are the purchase of more services and increased usage of production items. For example, the sale of fertilizer materials, which play an important part in the farm supply department of many elevators, had an increase of 127 percent in this period.[5]

The grain elevators in South Dakota face many adjustments. One is the adjustment to the decline in the number of farms and farmers. This trend toward fewer farmers is expected to continue in the future. At the same time, there is expected to be an increase in the demand for farm supplies and services, especially some of the newer goods and services such as automated record keeping and technical information and equipment in the fields of irrigation, chemical usage, and soil treatment.

All of this points out that the industry is dynamic and changing. Some elevators keep up with these changes, while others fail to adopt new ideas. What are the characteristics of firms that are growing as opposed to those that have a declining growth rate? What kind of services do the growing firms offer? What can one expect the future of the South Dakota grain elevator business to be like if present trends continue? How does one determine which elevators are likely to grow?

The answers to the above questions, which this study hopes to provide, have important implications for grain elevator operators.

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[5]United States Department of Agriculture, loc. cit.

farmers, and community leaders of small towns. Elevator operators want to know such things as which factors are related to growth as well as the relationship between certain products sold and the growth rate. Farmers have a direct interest in these changes because they affect marketing efficiency and ultimate prices on production items. Also, many small towns are dependent on a grain elevator as their main industry, therefore, their community leaders are concerned about anything which affects their elevator. Thus, there are many people, in both private and public life, who should be interested in the information this study will provide.

Objectives

The main objectives of this study are as follows:

1. To determine some of the present structural characteristics of the grain elevator industry in South Dakota.

2. To show the effect of selected variables on the growth rate of elevators from 1963 to 1968.

3. To study some of the relationships between the rail and truck transportation system and the future location and growth of grain elevators in South Dakota.

Review of Literature

Kansas State University Researchers studied cooperative grain elevators which carried on operations in 1963. Their study focused mainly on operational efficiency which was measured by determining the

amount of input required to produce a given output.[6] It did not attempt to predict what one can expect the future of the grain elevator industry to be like, nor did it try to determine the type of goods and services related to growth.

Warren L. Trock, assistant professor of agricultural economics at Montana State College, completed a study of the trends and prospective developments in the organization of the grain elevator system in Montana and North Dakota. He studied changes that have occurred in the past thirty years and then predicted changes and developments in the organization of the system in the next fifteen to twenty years. He also determined the probable production of grain and the demand for farm supplies; this enabled him to estimate the number of elevators needed in Montana and North Dakota fifteen to twenty years from now.[7] His study was not concerned with the factors affecting growth nor did he try to determine which elevators are likely to grow.

Studies at North Dakota State University indicated that the minimum optimum size of an elevator should be at least one million bushels. Transportation costs and the role of transportation in the

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[6] Milton L. Manuel and Richard L. Epard, An Economic Analysis and Recommendations for Improving the Management of Kansas Grain Cooperatives, Kansas State University of Agriculture and Applied Science, Bulletin 497, May, 1967.

[7] Warren L. Trock, Trends and Prospective Developments in Grain Elevator Operations, Montana Agricultural Experiment Station, Bulletin 596, April, 1965.

evolution of the grain marketing system were studied. The possibility of having some elevators serving as country terminals and having others act as collecting and storing agents was also analyzed. This study did not indicate the relationship between specific operating policies and growth nor the relationship between the type of goods and services and growth.[8]

John W. Sharp of Ohio State University also found that the minimum optimum size of an elevator should be at least one million bushels. He studied the storage capacities and the quality of storage that the Ohio elevators provide. His study was also concerned with transportation rates. It was not involved with specific operating policies of elevators nor with the factors affecting growth.[9]

Hypothesis

Since much of this thesis is concerned with descriptive analysis the following general hypothesis was developed:

The growth of grain elevators in South Dakota is affected by their operating policies and their product mix.

Other working hypotheses are developed for specific parts of the analysis related to the above hypothesis.

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[8]David C. Nelson, "Feasibility of Subterminal Grain Operations in the Upper Midwest" (unpublished work from the Upper Great Plains Transportation Institute, Project: A-ND-6701, North Dakota State University).

[9]John W. Sharp, "Need Larger, Efficient Elevators," Consolidated Grain and Feed Journals, (March, 1968), 18.

Procedures

1. Data were obtained from elevator operators through personal interviews and questionnaires. The data for elevators consisted of capacity, radius of business, change in radius, gross volume in dollars for 1968, number of full-time employees, net profit, change in capacity, number of technical goods and services, number of non-technical goods and services, credit policies, method of accounting, freight rates, and the method of transportation.

2. Chi-square analysis related the kind of goods and services to growth. Correlation analysis related growth in the elevator business to selected variables such as capacity, radius of business, change in radius, gross volume in dollars for 1968, number of full-time employees, net profit, change in capacity, number of technical goods and services, number of non-technical goods and services, and having a mainline railroad.

3. Chi-square analysis related growth in the elevator business to operating policies such as the length of credit granted, charging an interest or a service charge on accounts, offering bank note financing, offering full season financing, and the means of accounting.

4. Data were obtained from grain elevators, the railroads, and the highway department concerning present and future transportation facilities. This information was used to analyze the impact of the transportation system on the grain elevators of the future.

CHAPTER II

SOME STRUCTURAL CHARACTERISTICS OF THE SOUTH DAKOTA ELEVATOR INDUSTRY

Introduction

It is the purpose of this chapter to explain some of the structural characteristics of the South Dakota elevator industry by examining the number, size, location, and radius of business of the elevators. After each of these characteristics has been discussed, the number of elevators needed to achieve significant efficiencies will be analyzed.

Unique Characteristics of Grain Elevators

There are several characteristics of grain elevator firms which cause them to differ uniquely from production-oriented firms. Although these differences do not seriously influence the method of studying elevators, an awareness of them is important.

Grain elevators are generally providers of farm supplies and services and purchasers of grain, rather than producers of goods. Grain elevators usually do not procure and transform raw materials into finished products. Most of the factor inputs consist of labor, buildings, and equipment to provide the services and store the grain. For the above reasons, grain elevators must look to their internal operations for many efficiencies and to increased volume for higher levels of revenue rather than to increased external factors such as the cost of raw materials.

Grain elevators usually have their peak seasons and then do a small volume of business the rest of the year. Since these elevators are handling a relatively small amount of grain during the "slack" season, average fixed costs per unit of output are much greater than if they would be operated at uniform levels.

Compared to production-oriented firms, grain elevators have little advance knowledge of, or control over, their supply. During an abundant harvest, an elevator usually receives a greater supply of grain than during a poor harvest. Elevator operators usually construct facilities sufficient to handle the average volume of grain that is expected to be received during an average harvest. However, because of the fluctuations in marketing, the average volume handled per year is often much less than the maximum and much more than the minimum or vice versa; consequently, grain elevators operate some years with excess capacity and other years with too little capacity. All of this makes costs difficult to control.

Some additional characteristics which cause elevators to be unique are that they deal with a low margin, high risk, commodity. One reason the risk is high is because the market fluctuates rapidly, selling the grain a few hours sooner or later can make the difference between a profit or loss. Also, the margin on merchandising grain has increased little in recent years and in many cases has decreased. One way of maintaining a high profit is to diversify into other higher margin products and services such as farm supply goods.

Number, Size, and Location of Grain Elevators in South Dakota

On the average there are 150 million bushels of grain marketed annually by South Dakota farmers to elevators. Presently this grain is marketed to about 450 elevators. These elevators range in size from six thousand bushels to 1,246,750 bushels.

Table II-1 gives a breakdown of the capacity of elevators for 1963 and 1968. Elevators with 51 to 100 thousand bushel capacity were the most numerous in the state. The small elevators, those with 50 thousand bushel capacity or less, seem to have disappeared more rapidly than the others. These small elevators decreased from 89 to 60, a 33 percent decrease. Part of this decrease can be explained by small elevators merging with other small elevators or with larger elevators. Another explanation for the decrease in the number of small elevators is that some of them discontinued business and their business was then absorbed by the elevators of the surrounding area. For this reason many of the existing elevators are larger. The largest percentage increase was shown by the group of elevators that had a capacity of 301 thousand to 400 thousand bushels. This large increase may be the result of the smaller elevators merging into larger elevators. The net result of these increases and decreases is a five percent decrease in the total number of elevators of all sizes.

There are several reasons for the change in the number and size. One is the adjustment grain elevators are making because of the reduced income from the Commodity Credit Corporation. Commodity loans made in the United States during the fiscal year 1963 totaled 3.1 billion

Table II-1

Change in Storage Capacity of South Dakota Elevators from 1963 to 1968[a]

Bushels	The Number in 1963	The Number in 1968	The Percent Change of the Number of Elevators
50,000 or under	89	60	-33%
51,000 to 100,000	131	123	- 6%
101,000 to 150,000	93	95	+ 2%
151,000 to 200,000	69	70	+ 1%
201,000 to 300,000	58	60	+ 3%
301,000 to 400,000	24	35	+46%
401,000 to 500,000	12	7	-42%
over 500,000	14	16	+14%
Totals	490	466	- 5%

[a]South Dakota Elevators Licensed by the Public Utilities Commission to do Business in South Dakota for the Years 1963 and 1968.

dollars. There was a decrease in each of the following fiscal years until 1967 when the total commodity loans made for that year was 1.4 billion dollars.[10] Storage and handling expenses paid by the Commodity Credit Corporation during this period decreased from 380 million dollars to 150 million dollars.[11]

Another reason for fewer and larger elevators is that they are adjusting to new concepts in transportation. Some of the innovations being considered are unit trains, multi-car shipments, and guaranteed annual volume from a particular shipping point. All of these require large volumes of grain to be shipped from one point. Also the Grain Standards Act of 1968 permits interstate transactions of grain to be made without inspection and if the elevator operators choose to do so they can sell direct to a buyer, merchandiser, or exporter, and bypass the services of a terminal elevator.[12] This act will allow the grade of the grain to be known faster because the official inspectors can be in the country elevators. This also allows a lot of grain to be merchandised on sample or on mutual trust without the necessity of any inspection if both the buyer and seller agree to do so.

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[10] United States Department of Agriculture, Commodity Credit Corporation Charts, Washington, D. C., March, 1968, p. 12.

[11] Ibid., p. 14.

[12] David M. Pettus, "The New Grain Standards Act," Consolidated Grain and Feed Journals, (October, 1968) 13.

The map on Figure II-1 shows the location of the elevators which serve South Dakota. The number of elevators in a county tends to vary directly with the amount of marketable grain produced in the county. An example of this is Brown County which has the largest volume of grain available for marketing and it also has the largest number of elevators. Five counties in South Dakota have no elevators and four of these are in the Western part of the state. Four other counties in Western South Dakota have only one elevator per county.

Trade Areas of Elevators Studied

The trade areas were determined from data obtained from elevator managers who made estimates of the radius of the area served by their firm. The map on Figure II-2 shows the trade areas for 204 of the elevators studied. The map shows there is much overlapping of trade areas. Where the production is high, there are usually several elevators serving the same area. This map indicates that some areas could be served by fewer elevators without increasing the distance the farmers would have to travel to sell their grain or purchase farm supplies and services.

Table II-2 shows the distribution of radii in miles for the sample studied. The smallest radius was four miles while the largest was 150 miles. The most common radius was from six to ten miles. Thirty percent of the elevators in the sample had a radius greater than twenty miles. In many cases the elevators in Western South Dakota had a larger radius than the ones in the Eastern part of the state. The

Figure II-1

Location of Elevators in South Dakota, 1968

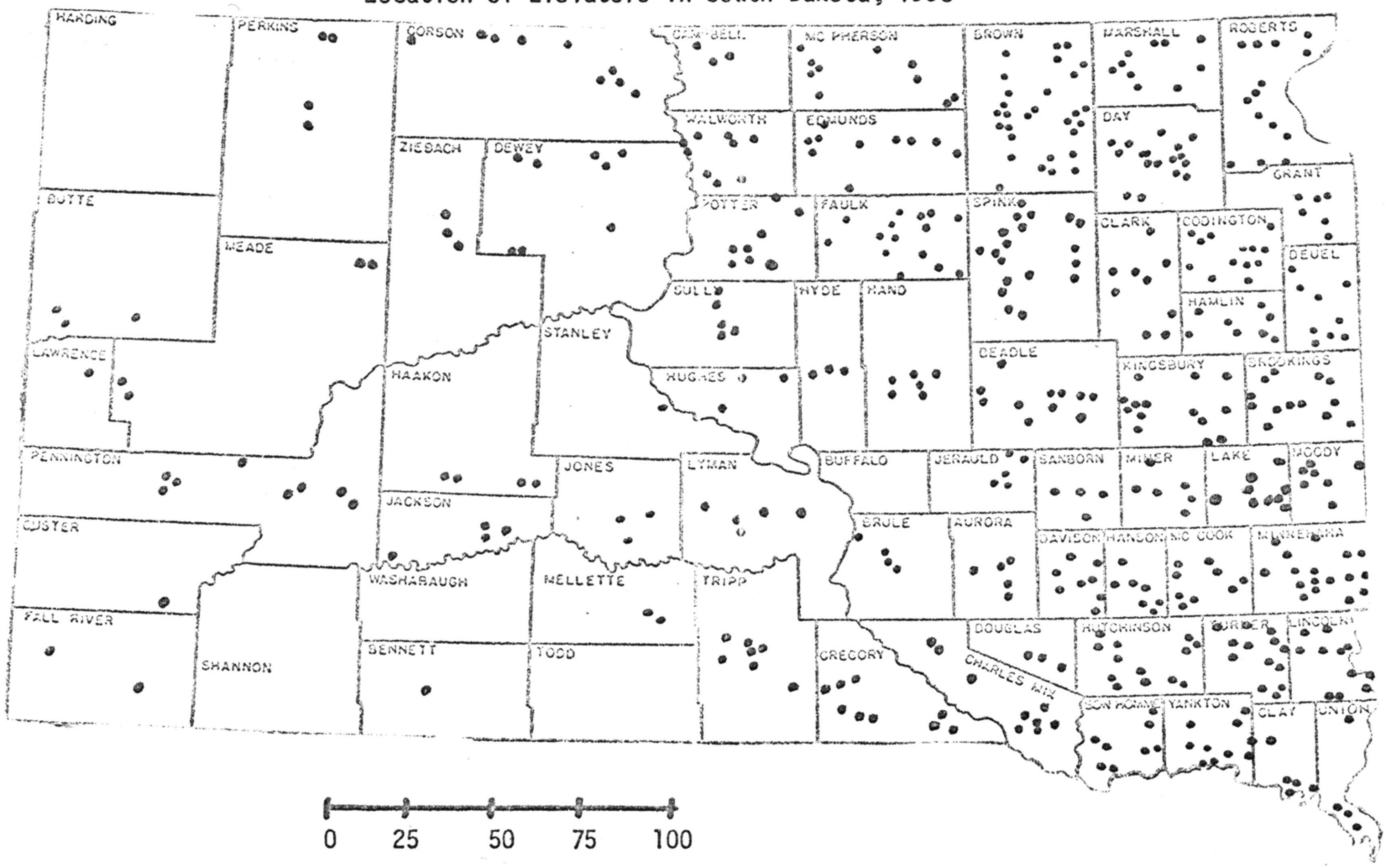
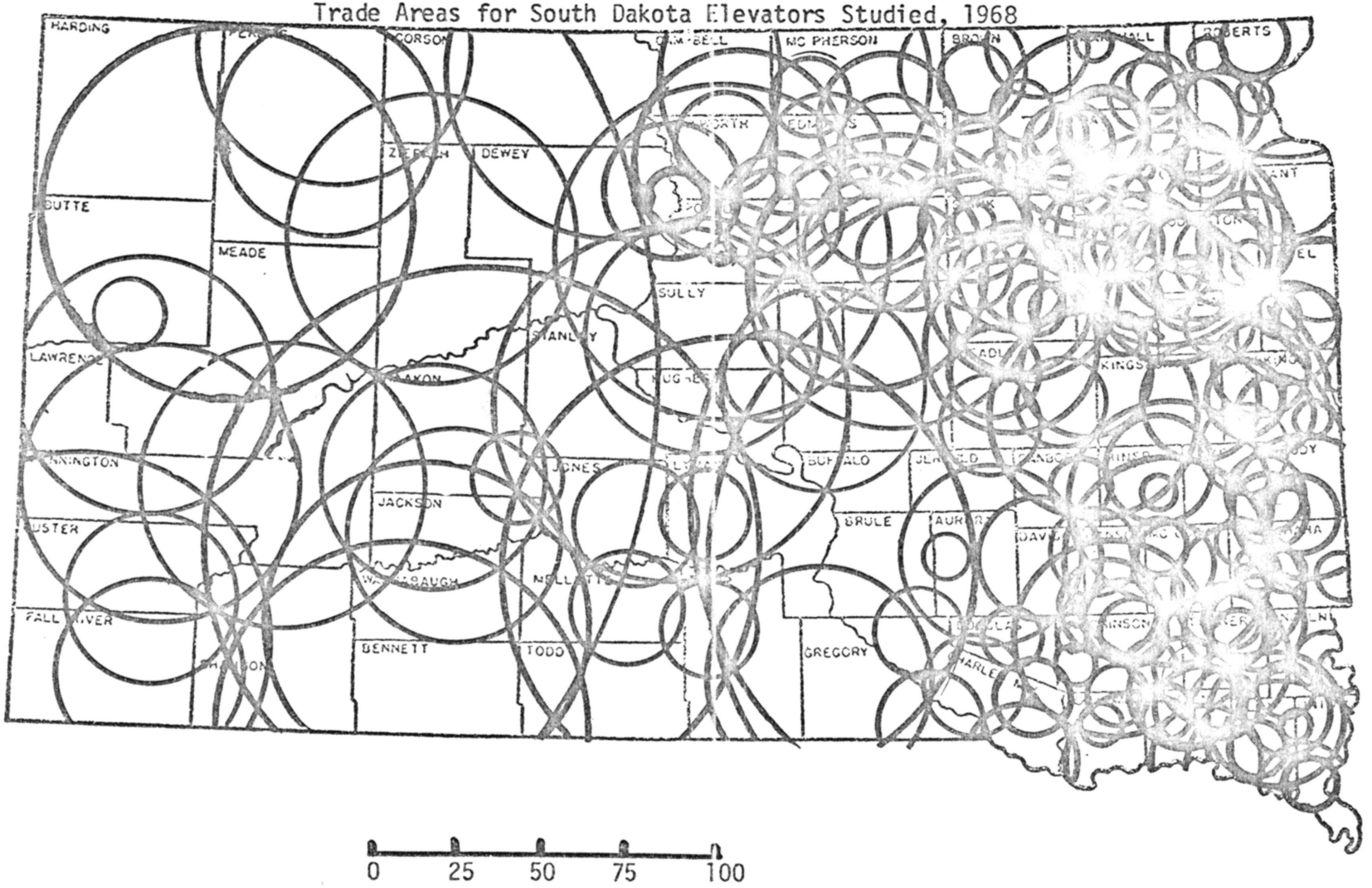


Figure II-2

Trade Areas for South Dakota Elevators Studied, 1968



main reason for this is that production density is usually greater for a given area in Eastern South Dakota than it is in Western South Dakota so it does not take as large an area to support an elevator.

Table II-3 shows the change of the radius for the same 204 elevators mentioned above. The majority of the elevators did not have a change in radius during the five year period from 1963 to 1968. None of the elevator managers reported a decrease in the radius of their business. Most of the increases were from one to five miles although seventeen of the elevators reported an increase of over ten miles. Some reasons for the increase in radius is that better roads and larger trucks allow farmers to haul grain a greater distance. Another reason is that in some cases fewer elevators are serving the same area so their radius has expanded.

If present trends continue South Dakota is likely to be served by fewer but larger elevators. To determine how many elevators might be needed to serve the state if all elevators in the state had the same trade area radius as the largest elevators, the average radius for the 18 large elevators in South Dakota was calculated. Large elevators were defined as those elevators which have a capacity of at least 300 thousand bushels or a dollar volume of over one million dollars per year. This dollar volume includes both grain merchandised and farm supplies sold.

Figure II-3 shows a hypothetical distribution of elevators if they all had a trade area radius of 32.4 miles, the average radius for the 18 large elevators, and if they served the whole state. This hypothetical

Table II-2

Radius of Business for South Dakota
Elevators Studied, 1968

Miles	Number of Elevators
1 to 5	7
6 to 10	59
11 to 15	42
16 to 20	33
21 to 50	51
51 to 100	11
over 100	1
Total	204

Table II-3

Change in Radius of Business from 1963 to 1968
for South Dakota Elevators Studied

Miles	Number of Elevators
0	114
1 to 5	47
6 to 10	26
11 to 15	4
16 to 20	1
21 to 50	8
51 to 100	4
over 100	0
Total	214

distribution indicates that the state could be served by only 34 elevators and no single farmer would be more than 33 miles from a major elevator.

Figure II-4 shows a distribution of elevators that is not randomly selected, but rather they represent the present location of some elevators. This map shows that the present area of the state served by elevators could be served by 34 of the existing elevators. This figure does not take into consideration other criteria such as the transportation systems or the capacity of the existing elevators, but rather it is only concerned with the radius.

The probability of such a system with so few elevators emerging in the near future is quite low. Nevertheless, the data do suggest that far fewer elevators than presently exist could serve the state and probably without a serious loss of efficiency.

Number of Elevators in the Future

It can be shown that South Dakota could be served by fewer elevators based on the volume of grain they are currently handling. Storage and handling cost studies, cited previously, at North Dakota State University, as well as work done at Ohio State University, indicate that a minimum volume of one million bushels is needed before unit costs can be reduced to a level where charges for performing the functions of storage and standardization can be attractive to the farmers and still leave a profit for the elevators. This same data should be applicable to South Dakota.

Figure II-3

Minimum Number of Elevators Needed to Serve South Dakota Based on the 1968 Radius of Large Elevators

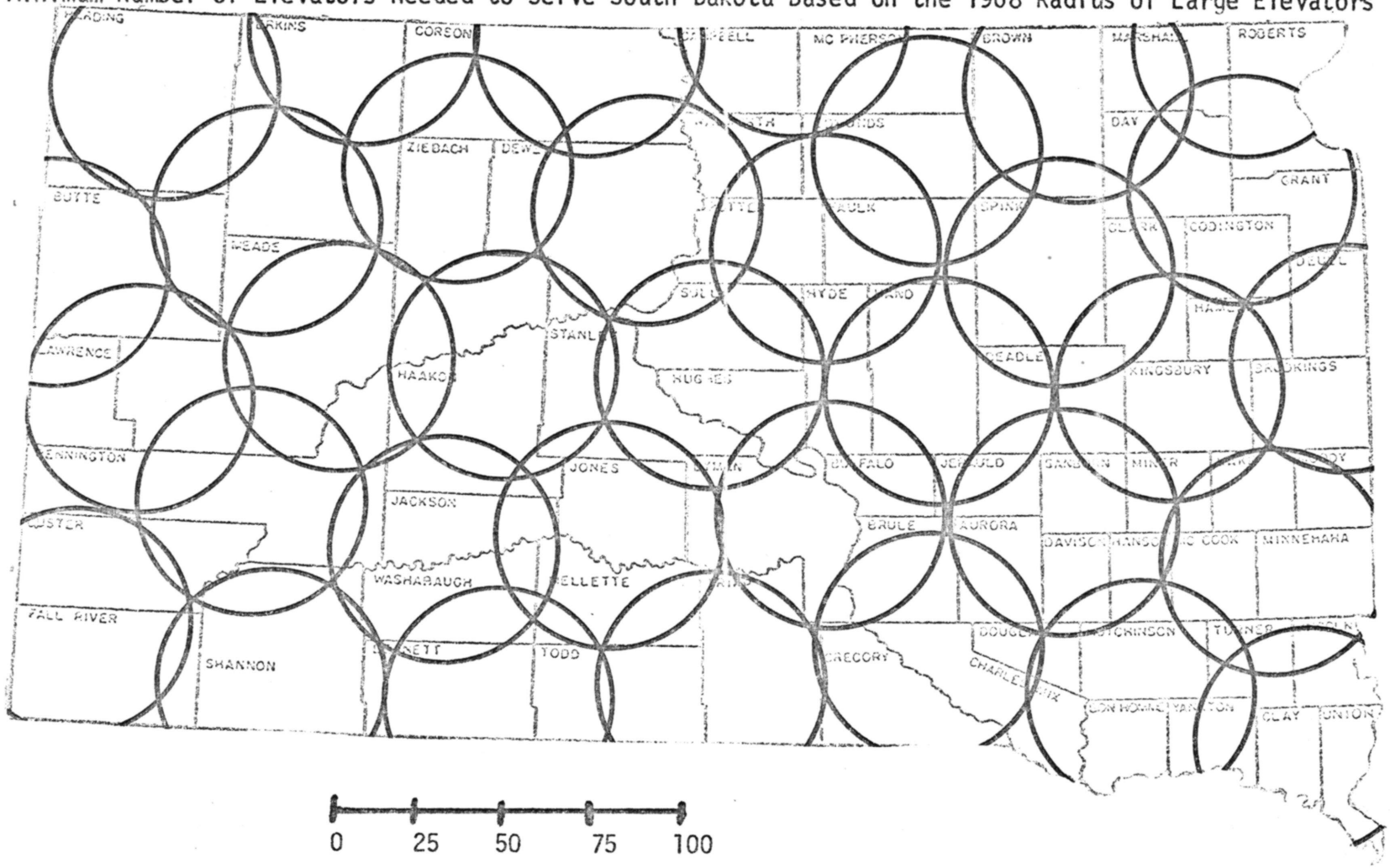
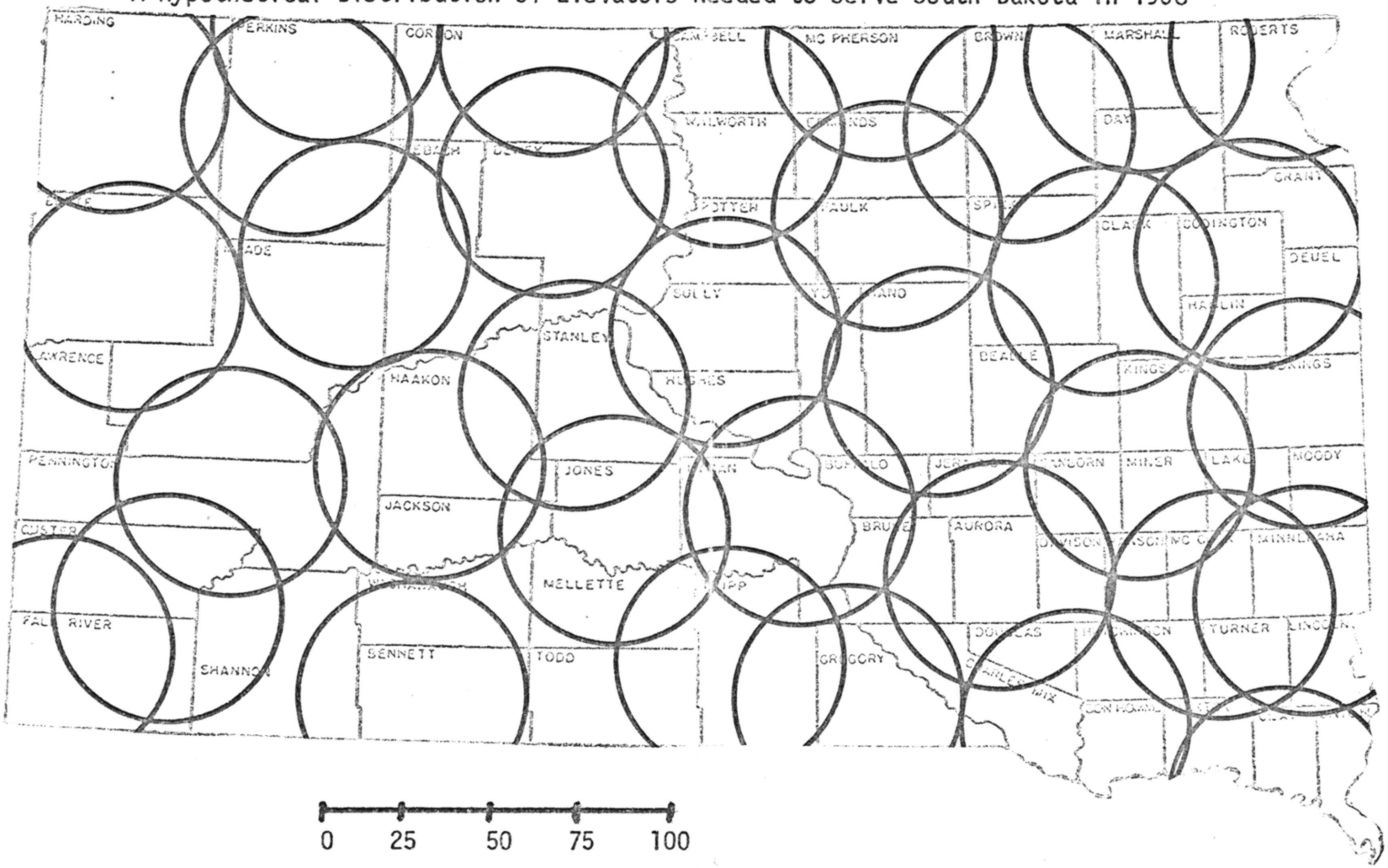


Figure II-4

A Hypothetical Distribution of Elevators Needed to Serve South Dakota in 1968



These studies indicate that unit costs continue to be reduced when annual volume is increased to 2.5 million bushels. They do not indicate the volume level at which unit costs would start to increase; however, it is safe to assume this level is in excess of 2.5 million bushels annual volume, given current levels of technology.

Table II-4 shows the amount of grain produced in each county and the number of grain elevators in the county. The last column shows the amount of grain available to each elevator. If it is assumed that the amount of grain which leaves a county and is sold to an elevator in another county is balanced by the same amount of grain entering an elevator from outside the county, then in only two cases in South Dakota is the amount of grain available to each elevator in the county over one million bushels.

In Brown County there are currently 29 elevators. If each elevator in Brown County is to reach the minimum optimum volume of one million bushels of grain handled per year, only about nine elevators would be needed. Brown County was just used as an example, the same results would be true of many other counties in South Dakota. This seems to indicate that the number of elevators in South Dakota is too large for the amount of grain available and that significant efficiencies could be achieved in the marketing of grain if fewer but larger elevators served the state.

Table II-4

Average Amount of Grain Available to South Dakota Elevators, by Counties, 1964 to 1967[a]

County	Total Bushels of Corn, Wheat, Oats, Barley, Rye, Flax, Soybeans & Sorghum Available for Marketing[b]	Number of Grain Elevators in the County	Amount of Grain Available to Each Elevator in Bushels
Brown	8,934,111	29	308,072
Spink	6,775,176	18	376,398
Day	4,883,217	14	348,801
Roberts	4,756,956	14	339,782
Minnehaha	4,738,202	16	296,137
Turner	4,120,911	12	343,409
Lincoln	4,101,747	9	455,749
Brookings	3,692,290	11	335,662
Union	3,655,094	6	609,182
Edmunds	3,616,460	10	361,640
Clark	3,487,444	9	387,493
Moody	3,368,004	9	374,222
Hutchinson	3,341,883	12	278,490
Tripp	3,307,644	7	472,520
Sully	3,254,860	5	650,972
Kingsbury	3,203,414	15	213,560
Marshall	3,155,613	10	315,561
Grant	3,109,365	5	621,873
Clay	3,103,993	5	620,798
Lyman	3,074,174	5	614,834
Codington	3,057,225	12	254,768

Table II-4 Continued

Faulk	3,014,667	14	215,333
Beadle	2,856,951	14	204,067
Yankton	2,849,416	9	316,601
Potter	2,801,072	7	400,153
Hamlin	2,791,469	7	398,781
Deuel	2,788,860	9	309,873
Perkins	2,696,886	4	674,221
Charles Mix	2,687,580	9	298,620
McPherson	2,652,187	10	265,218
Walworth	2,558,555	9	284,283
Bon Homme	2,514,088	7	395,155
Corson	2,500,446	9	277,827
Lake	2,475,340	9	275,037
McCook	2,466,051	9	274,005
Hand	2,343,690	5	468,738
Campbell	2,197,061	3	732,353
Meade	1,698,947	4	424,736
Bennett	1,692,867	1	1,692,867
Hanson	1,509,529	7	215,647
Pennington	1,500,162	5	300,032
Gregory	1,499,268	9	166,585
Jones	1,485,750	3	495,250
Miner	1,446,681	7	206,668
Hughes	1,421,932	3	473,977
Haakon	1,416,987	4	354,246
Aurora	1,276,432	6	212,738
Davison	1,245,424	6	207,570
Dewey	1,266,213	8	158,276
Brule	1,113,722	4	278,430
Stanley	1,040,995	1	1,040,995
Douglas	987,727	6	164,621

Table II-4 Continued

Sanborn	890,417	5	178,083
Jerauld	819,927	5	163,985
Mellette	806,372	2	403,186
Shannon	754,135	0	0
Harding	723,146	0	0
Ziebach	678,058	3	226,019
Washabaugh	621,461	0	0
Fall River	559,497	1	559,497
Hyde	557,074	3	185,691
Butte	546,840	3	182,280
Jackson	455,246	4	113,811
Todd	429,657	0	0
Buffalo	272,185	0	0
Lawrence	146,070	1	146,070
Custer	88,911	1	88,911

[a]South Dakota Crop and Livestock Reporting Service, 1964, 1965, 1966, and 1967; Sioux Falls, South Dakota.

[b]The method used in calculating the amount of grain available for marketing in each county was the same as that used by the U. S. Department of Commerce and the Bureau of the Census in their calculations. The total production of each type of grain was multiplied by the following percentages:

Corn -- 40%	Oats -- 35%	Rye -- 95%	Soybeans -- 96%
Wheat -- 96%	Barley -- 58%	Flax -- 96%	Sorghum -- 45%

CHAPTER III

THE PRODUCT MIX AND ELEVEN OTHER FACTORS AFFECTING SOUTH DAKOTA ELEVATORS

Introduction

It is the purpose of this chapter to discuss the relationship between the growth of an elevator and several other variables. First, the general characteristics of the sample were examined. Then the relationship between specific goods and services and the growth rate were analyzed. An analysis was made to determine if the farm supply and service departments were growing faster than the grain merchandising departments because this could have many implications. Finally the relationship between eleven variables was analyzed.

General Characteristics of the Sample Studied

The sample studied consisted of 219 elevators in South Dakota conducting business operations during 1968. This represented about 48 percent of the elevators in the state. Questionnaires were sent to 476 elevators and 219 usable questionnaires were returned. The sample was assumed to be a representative sample because the size and location characteristics of the elevators in the sample were proportionate and similar to those observable in the population.

Size Characteristics

The smallest volume of grain handled by any one of the elevators during 1968 was 15,000 bushels while the largest volume was 2,378,649

bushels. See Table III-1. Only eleven of the elevators reporting handled over one million bushels of grain annually, which suggests that, according to the North Dakota and Ohio studies cited previously, only eleven of the elevators have a large enough volume to achieve some minimum economies of scale.

Growth Rates

In a dynamic industry, such as the grain elevator industry, growth rates are of great concern. Table III-2 shows the growth rates for the elevators studied. To determine the growth rate, the percentage change in gross volume in dollars from 1963 to 1968 was calculated. Gross volume in dollars is the sum of grain merchandised and farm supplies sold. The data were deflated to 1958 dollars. Thirty-four elevators showed a zero or negative growth rate while 30 elevators had a growth rate of over 90 percent for the five year period studied. This growth rate of over 90 percent for the five year period is an average annual growth rate of over 18 percent. These rates ranged from -42 to +637.

To determine the rate at which both the farm supply and service departments and the grain merchandising departments have grown during the five year period studied, the percentage change in gross volume for both departments was calculated and the departments were classified as rapidly growing, slowly growing and declining. Throughout this study a rapidly growing elevator is one with a growth rate for the five year period of over 30 percent, a slowly growing elevator had a growth

Table III-1

Amount of Grain Handled By South Dakota Elevators, 1968

Bushels Handled	Number of Elevators
100,000 or under	22
101,000 to 200,000	29
201,000 to 300,000	33
301,000 to 400,000	34
401,000 to 500,000	17
501,000 to 1,000,000	59
Over 1,000,000	11
Total	205

Table III-2

Growth Rate for South Dakota Elevators
from 1963 to 1968

Percent Growth	Number of Elevators
Less than -50%	0
-49% to -25%	9
-24% to 0%	25
1% to 15%	22
16% to 30%	15
31% to 45%	18
46% to 60%	16
61% to 75%	12
76% to 90%	8
91% to 105%	7
106% to 125%	3
126% to 150%	4
Over 150%	16
Total	155

Based on 1958 Dollars.
Growth Rate is the Percentage Change in Gross Volume of Business in Dollars.

rate from one to 30 percent, and a declining elevator had a growth rate of zero or less. Table III-3 shows these growth rates by department for the elevators studied. It is readily apparent that the farm supply and service departments had a more rapid growth rate than the grain merchandising departments. Over 50 percent more of the farm supply and service departments were classified as rapidly growing when compared to the grain merchandising departments. Those classified as slowly growing were about equal for both departments. However, the grain merchandising departments had over twice as many declining growth rates as the farm supply and service departments. This indicates that much of the growth in grain elevators during the five year period studied was in the farm supply and service departments.

Table III-3

Growth Rates of Farm Supply and Service Departments and Grain Merchandising Departments for South Dakota Elevators, 1963 to 1968

Growth Rates In Percent	Number of Farm Supply And Service Departments Rapidly Growing	Number of Grain Merchandising Departments Rapidly Growing
Over 700	3	0
601 to 700	1	0
501 to 600	0	0
401 to 500	1	0
351 to 400	6	0
301 to 350	2	0
251 to 300	1	0
201 to 250	3	1
176 to 200	5	3
150 to 175	4	1
126 to 150	2	4
101 to 125	4	3
91 to 100	4	2
81 to 90	1	5
71 to 80	4	1
61 to 70	2	3
51 to 60	6	6
41 to 50	10	9
31 to 40	8	6
Total	67	44
	Slowly Growing	Slowly Growing
26 to 30	10	7
21 to 25	13	3
16 to 20	7	10
11 to 15	10	10
6 to 10	4	6
1 to 5	4	9
Total	48	45
	Declining Growth	Declining Growth
-15 to 0	11	24
-24 to -15	6	10
-49 to -25	2	15
-99 to -50	6	2
Less than -100	0	0
Total	25	51

Growth of Net Profit

Every businessman is concerned with annual net profit. Only 175 managers stated their net profit for 1968. See Table III-4. The figures ranged from a loss of 41,862 dollars to a net profit of 218,142 dollars. One explanation for this wide range may be the variation in weather conditions over the state. It is also possible that those elevators with low net profits were reluctant to answer the question concerning net profit; hence, the data in Table III-4 may tend to be slightly biased toward elevators that had a high net profit.

Types of Goods and Services Affecting Growth

This part of the study is concerned with which, if any, of the goods and services sold by the elevators are related to growth. The hypothesis developed for testing here is: There is no relationship between the types of goods and services sold and the growth of an elevator. A chi-square test of independence was used to test this hypothesis. For the application of these tests, the elevators were classified as rapidly growing, slowly growing, and declining. The basis for this classification is the same as previously used. If an elevator had multiple locations each individual station was studied separately.

Twenty-three of the goods and services listed on the questionnaire were tested separately to determine if there was a relationship between the types of goods and services handled and the growth of an elevator. The chi-square test of independence yielded an index of the degree to which the observed data derived from the sample survey deviated from the expected data that would be present if there was complete

Table III-4

Net Profit for South Dakota Elevators, 1968

Amount of Profit	Number of Elevators
A Loss	15
0 to 5,000	37
5,100 to 10,000	33
10,100 to 15,000	22
15,100 to 20,000	18
20,100 to 50,000	43
50,100 to 100,000	4
Over 100,000	3
Total	175

statistical independence. If the deviations were large enough to yield a larger chi-square value than the tabular value, the hypothesis of statistical independence was rejected and the alternative hypothesis that there was some form of association between the variables was accepted. This test merely tests the hypothesis of statistical independence; it does not determine the exact degree of association between the variables but in general the greater the magnitude of the chi-square value the stronger the association. See Figure III-1 for the calculation of the chi-square test.

Table III-5 contains the results of the chi-square test of independence. The goods and services that had the strongest (5 percent level of significance) correlation with growing elevators were fertilizer specialists, farm mapping, bulk fertilizer, and liquid feed. Those that showed a relationship at the ten percent level of significance were seed cleaning, bagged fertilizer, and anhydrous fertilizer. There was no dependency between the sale of the remaining goods and services and growth, thus, the same hypothesis is refuted for the remaining goods and services.

The two goods and the two services which reject the null hypothesis at the five percent level of significance can be called technical goods and services. Technical goods and services are those goods and services which are demanded because of recent innovations in production or marketing. Thus, they seem to be different from the ordinary goods and services sold.

Figure III-1

Chi-Square Calculations

Analysis Procedure:

1. Null Hypothesis: There is no relationship between the types of goods and services sold and the growth of an elevator.

   Alternative Hypothesis: There is a relationship between the types of goods and services sold and the growth of an elevator.

2. Population: The elevators who returned their questionnaires with questions four and five completely answered. This was a total of 155 elevators.

3. $X^2 = \frac{\sum(0-e)^2}{e}$ With two degrees of freedom

   Where:
   0 equals observed frequency
   e equals theoretical frequency

4. Region of rejection equals X^2 5.99

   When Alpha level of significance equals .05.

Table III-5

Chi-Square Results of the Relationship Between Growth and the Product Mix of South Dakota Elevators, 1968

	Good or Service Tested	Chi-Square Results
**	Seed cleaning	4.9059
	Feed grinding	1.8697
	Bulk feed delivery	0.0613
	Grain and general trucking	1.4414
	Semi-trailer and long distance hauling	.6650
	Feed specialists	1.5361
*	Fertilizer specialists	7.4111
*	Farm mapping	9.3986
	On the farm calls for tires, batteries, and accessories	.6222
	Employ full-time carpenters	.9933
***	Record keeping for customers	4.2206
	Radio dispatched trucks	1.0951
**	Fertilizer-bagged	4.9184
*	Fertilizer-bulk	11.3072
	Fertilizer-liquid	3.1911
**	Fertilizer-anhydrous	5.1840
	Feed-bagged	3.0919
*	Feed-liquid	15.0231
	Feed-bulk	4.2689
	Petroleum-bulk plant	1.7191
	Petroleum-retail station	.1512
	Hardware goods, fencing, etc.	1.5961
	Lumber	3.3258

* Significant at the 5 percent level
** Significant at the 10 percent level
*** Significant at the 15 percent level

Some conclusions that can be derived from the overall results of these tests are that the rapidly growing elevators are the first ones to introduce these technical goods and services. Having one or more of these technical goods and services does not mean it will cause the elevator to grow rapidly, but rather the elevators which are innovators and have upgraded their product mix by including these technical goods and services tend to be the ones which are most likely to be rapidly growing.

The Relationship Between the Gross Volume of Business and Other Variables

It is the purpose of this section to determine if there is a relationship between the gross volume of business and other selected variables. The gross volume of business includes the dollar value of the farm supplies and services sold and the grain merchandised. An analysis was made for the small, medium, and large elevators as well as for all elevators combined. The small elevators were those that had a gross volume of business of less than 400,000 dollars during a year. The medium-sized elevators were those that had a gross volume of business between 400,000 dollars and 800,000 dollars. On the basis of this classification there were 71 small elevators, 52 medium elevators, and 32 large elevators. The largest gross volume of an elevator in the study was 2,105,300 dollars while the smallest gross volume was 13,400 dollars.

The results of the simple correlation analysis are reported in Table III-6. In general the data indicate that the size of elevators

in terms of gross volume of business in 1968 was not related, in any substantial degree, to the bushel capacity of the elevator; the radius of the trade area served by the elevator in 1968; the change in the radius of business from 1963 to 1968; the number of full-time employees; or net profit. Thus, the size of an elevator as measured by gross volume of business is not dependent upon any of these factors.

Correlation Results of Factors Affecting Growth

In the next analysis, the results of eleven simple correlation tests will be examined. In these tests each variable was a dependent variable once and in the remaining tests it was an independent variable. The results are shown in Table III-7. Each of these will be discussed in turn.

The storage capacity in bushels (X_1) was the first variable analyzed. The number of full-time employees (X_6) seems to be significantly related to capacity. One reason for this may be that a larger elevator can employ more men and have the men specialize in handling various goods and services. Net profit (X_7) also seems to be related to capacity. This suggests that the larger elevators can achieve a higher degree of economies of scale and the result may be a larger profit. In the past few years margins have not increased and in many cases they have decreased, thus, if elevators want to maintain their profits, they may have to handle more grain.

Table III-6

Results of Correlating the 1968 Gross Volume in Dollars of South Dakota Elevators to Other Variables

The Variable	Small Elevators	Medium Elevators	Large Elevators	Total of all Elevators
Capacity in Bushels of Storage Space	$r = 0.07$ $r^2 = 0.01$	$r = -0.17$ $r^2 = 0.03$	$r = -0.03$ $r^2 = 0.00$	$r = 0.27$ $r^2 = 0.07$
1968 Radius of Business	$r = -0.41$ $r^2 = 0.17$	$r = 0.02$ $r^2 = 0.00$	$r = 0.18$ $r^2 = 0.03$	$r = 0.29$ $r^2 = 0.08$
Change in Radius of Business from 1963 to 1968	$r = -0.28$ $r^2 = 0.08$	$r = -0.11$ $r^2 = 0.01$	$r = 0.09$ $r^2 = 0.01$	$r = 0.17$ $r^2 = 0.03$
Growth Rate from 1963 to 1968	$r = 0.17$ $r^2 = 0.03$	$r = 0.04$ $r^2 = 0.00$	$r = 0.27$ $r^2 = 0.07$	$r = 0.26$ $r^2 = 0.07$
Number of Full-time Employees	$r = 0.33$ $r^2 = 0.11$	$r = 0.17$ $r^2 = 0.03$	$r = -0.04$ $r^2 = 0.00$	$r = 0.22$ $r^2 = 0.05$
Net Profit for 1968	$r = 0.33$ $r^2 = 0.11$	$r = 0.32$ $r^2 = 0.10$	$r = 0.08$ $r^2 = 0.01$	$r = 0.36$ $r^2 = 0.13$

Table III-7

Correlation Results of Eleven Factors Affecting South Dakota Elevators

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
X_1	1.00										
X_2	0.51	1.00									
X_3	0.08	0.58	1.00								
X_4	0.21	0.34	0.16	1.00							
X_5	0.17	0.17	0.27	0.22	1.00						
X_6	0.76	0.51	-0.01	0.20	0.05	1.00					
X_7	0.66	0.44	0.05	0.39	0.13	0.81	1.00				
X_8	0.33	0.16	0.25	0.06	0.18	0.07	0.16	1.00			
X_9	0.24	0.22	0.13	0.11	0.24	0.34	0.27	0.00	1.00		
X_{10}	0.24	0.22	0.13	0.14	0.22	0.41	0.38	0.04	0.55	1.00	
X_{11}	0.14	0.15	0.16	0.19	-0.10	0.09	0.08	-0.06	0.02	0.12	1.00

X_1 = Storage Capacity in Bushels
X_2 = Radius of Business
X_3 = Change in Radius of Business
X_4 = Gross Volume in Dollars, 1968
X_5 = Growth Rate
X_6 = Number of Full-time Employees
X_7 = Net Profit, 1968
X_8 = Change in Storage Capacity in Bushels
X_9 = Number of Technical Goods and Services
X_{10} = Number of Non-technical Goods and Services
X_{11} = Mainline Railroad

In the next analysis, the radius of business (X_2) for 1968 was correlated to the other variables. The three variables that tend to show the closest relationships are the change in radius (X_3), the capacity (X_1), and the number of full-time employees (X_6). This may indicate that the elevators with a large radius of business are the ones which have the greatest increase in radius, the largest capacity, and employ more men. In other words, the large elevators seem to be the ones which are getting larger faster.

The change in the radius of business from 1963 to 1968 (X_3) was also correlated to other variables. None of the coefficients was very high, thus indicating the lack of any strong relationship between these variables. The radius of business in 1968 (X_2), the growth rate (X_5), and the change in capacity (X_8) are the variables most closely related, albeit very weakly related, to the change in radius.

The relationship between the gross volume in dollars for 1968 (X_4) and the other variables was discussed earlier. However, the variable which appears to be most closely related is net profit (X_7). This may suggest that as the gross volume in dollars increases, the net profit becomes larger.

No significant relationship was shown between the growth rate (X_5) and the other variables. The variable which showed the highest relationship is the change in radius (X_3). This may mean that when an elevator grows in terms of dollar volume, its radius of business also increases.

The next variable correlated to the other variables is the number of full-time employees (X_6). One variable that showed a significant

relationship to the number of full-time employees is net profit (X_7). One reason for this outcome may be that when an elevator employs several men, each man can specialize in a few areas and the result may be an increase in production per man. This may tend to increase the net profit. The number of full-time employees is also significantly related to the storage capacity in bushels (X_1). It is probable that the larger elevators which handle a large volume of grain are the ones which employ more men.

The relationship between net profit (X_7) and other variables was analyzed next. The variables having the highest r values are the number of full-time employees (X_6) and storage capacity (X_1). The relationship between the number of full-time employees and net profit was discussed above. The relationship between net profit and capacity is very likely due to the fact that a large elevator has the opportunity to achieve a higher degree of economies of scale and the result may be a higher profit. There appears to be no relationship between profit and the variables related to growth. The change in capacity (X_8), the growth rate (X_5), and the change in radius (X_3) all have low r values. Although if an elevator has a high net profit, this does not indicate that it is a rapidly growing elevator.

No significant relationship was shown between the change in storage capacity (X_8) and the other variables. The variable showing the highest relationship to the change in storage capacity is the storage capacity (X_1). This suggests that the only grain merchandising departments that are growing are those that are already large.

If this is true and if the trend continues the merchandising of grain will soon be concentrated in the hands of a few large elevators. One of the factors influencing this is the economies of scale available to large elevators.

The analysis between the number of technical goods and services (X_9) and the other variables also showed no significant relationship. Since the variable that showed the highest relationship is the number of non-technical goods and services (X_{10}), this suggests that those elevators that have a number of non-technical goods and services also have a number of technical goods and services.

The relationship between the number of non-technical goods and services (X_{10}) and the other variables showed no significant results. As discussed above, there may be a slight relationship between the number of non-technical goods and services and the number of technical goods and services (X_9). The variable showing the next highest relationship is the number of full-time employees (X_6), which suggests that as an elevator handles more goods and services it hires more employees.

Table III-7 also shows the relationship between having a mainline railroad (X_{11}) and other variables. The gross volume in dollars (X_4) is the variable with the highest r value, but the size of the coefficient indicates it is a very weak relationship. The correlation between having a mainline railroad and the growth rate (X_5) is -0.10159 which indicates there is no relationship between these two variables. In most of the correlation analyses made in this section, having a

mainline railroad did not seem to be too important. However, in the future being on a mainline railroad may be more important than in the past because more branchlines might be discontinued and special services and special rates may apply to businesses with mainline rail service.

In summary, the strong relationships shown in Table III-7 are that the number of full-time employees (X_6) is related to the storage capacity in bushels (X_1) and to the net profit (X_7). Although other relationships existed, they were not as strong as these.

CHAPTER IV

THE EFFECT OF SOME OPERATING POLICIES ON GROWTH

The purpose of this chapter is to discuss some of the operating policies of 219 South Dakota elevators and then to determine if there is any relationship between the growth rate of these elevators and their operating policies.

The necessity of granting credit and keeping accurate records is more important today than ever before. When the elevator managers were asked on the questionnaire what their major problems were, the answer given most often was related to credit. They went on to explain that it was often difficult to give their customers the large amount of credit they needed and some elevators indicated difficulties with collecting their accounts receivable.

Table IV-1 gives a summary of some of the operating policies of the sample studied for 1963 and 1968. Granting credit up to sixty days was the most popular length of time for the elevators studied. The number that granted no credit and the number that granted credit up to 30, 60, and 90 days did not change significantly between 1963 and 1968. Thus, there was no great change in the length of time for which credit was granted during this five year period. It is important to note that a small number of the elevators studied did not grant any credit.

There was an increase in the number charging an interest or service charge for accounts of less than thirty days. But in 1968

this still included only thirteen elevators. There was a large increase in the number charging an interest or service charge for accounts of more than thirty days. It appears that elevators are not extending credit for a longer length of time, but more of them are charging an interest or service charge. The increased demand for credit by farmers may be a result of the increasing size of farms and the corresponding increasing size of farm supply purchases by individual farmers. Added to this is the general trend of higher interest rates which cause elevators to compensate for the higher rates by charging an interest or service charge on their accounts.

There was also a great increase in the number of elevators which offer long-term financing such as full season financing and bank note financing. The number that offer full season financing increased from 27 to 43 or by nearly sixty percent for the five year period studied while those offering bank note financing increased from 22 to 60 or by over 170 percent. Both of these methods are used to attract new customers and to keep present customers.

Table IV-1 shows the number of elevators using departmental cost accounting increased from 30 to 49 or by about 63 percent. One reason for this may be that the present competitive conditions force more elevators to use this method of accounting. Cost accounting by departments provides the manager with an accurate appraisal of the contribution each department makes to total and net sales. This enables a manager to make more informed decisions on which areas of the business to expand or contract. Cost accounting may aid the elevator operators in

distributing their available labor so they will receive maximum returns. It may also aid them in making other management decisions. In most cases the additional accounting costs are quite small.

Table IV-1

Summary of Some of the Operating Policies of 219 Elevators in South Dakota, 1963 and 1968

The Operating Policy	Number of Elevators in 1963	Number of Elevators in 1968
No credit granted	26	31
Credit up to 30 days	71	82
Credit up to 60 days	96	100
Credit up to 90 days	78	73
Interest or service charge for accounts less than 30 days.	6	13
Interest or service charge for accounts of more than 30 days.	44	137
Offer full season financing	27	43
Offer bank note financing	22	60
Departmental cost accounting	30	49

The Relationship Between Some of the Operating Policies to Growth

This part of the study is concerned with which, if any, of the operating policies are related to growth. The hypothesis developed is: There is no relationship between specific operating policies and the growth of an elevator. A chi-square test of independence was used to test this hypothesis.

For the application of these tests, the elevators were classified as rapidly growing, slowly growing, and declining. The classification used here was the same as the one used in Chapter Three. The rapidly growing elevators had a growth rate of over six percent, the slowly growing elevators had a growth rate from one to six percent, and the declining elevators a growth rate of zero percent or less. Nine of the operating policies listed on the questionnaire were tested separately at the five, ten, and fifteen percent level of significance.

Table IV-2 shows the results of the chi-square test of independence. The first three operating policies listed in the table are concerned with the length of time for which credit was granted. Only nine elevators from the sample granted no credit, thus most of the elevators are concerned with credit policies. No significant relationship was found between granting credit for thirty days and the growth rate. However, there was a slight negative relationship between granting credit for sixty days and the growth rate. This was significant at the fifteen percent level. This weak relationship might indicate that those elevators that granted credit up to sixty days tend to be the ones that have a declining growth rate. Finally,

Table IV-2

Chi-Square Results of the Relationship Between Some Operating Policies and the Growth of South Dakota Elevators from 1963 to 1968

Operating Policy Tested	Chi-Square Value
Credit granted up to 30 days	2.405
***Credit granted up to 60 days	4.130
** Credit granted up to 90 days	6.750
Interest or service charge for accounts of more than 30 days	2.858
Offer full season financing	1.593
* Offer bank note financing	9.410
Departmental cost accounting	.679

* Significant at the 5 percent level
** Significant at the 10 percent level
***Significant at the 15 percent level

2 Degrees of Freedom

there is a strong negative relationship between granting credit for ninety days and the growth rate.

There may be several reasons for this outcome. Those elevators that are extending credit up to ninety days may have a large portion of their assets in the form of accounts receivable. When their assets are in this form, they may not be able to make the investments which are important for their business and this may result in a slower growth rate. Also, when credit is granted for a long period, it may mean that a large portion of the accounts receivables end up as uncollectables. This can be detrimental to any business and can reduce the growth rate.

The next analysis made was the relationship between charging an interest or a service charge and the growth rate. Only a small percent of the elevators charged an interest or service charge for accounts of thirty days or less. Over half of the elevators in the sample studied charged an interest or service charge for accounts of thirty days or more and they were evenly distributed between the declining, slowly growing, and rapidly growing elevators. Thus, no relationship was found between charging an interest or a service charge for accounts of thirty days or more and the growth rate.

The effect of long-term financing on growth was also analyzed. The two types analyzed were full season financing and bank note financing. No relationship was found between offering full season financing and the growth of an elevator; however, a very strong relationship between bank note financing and the growth rate was found.

There are several reasons for these results. When an elevator offers full season financing, it may have a large amount of its assets in the form of accounts receivable. The interest income the elevator is earning from the accounts receivable may not be competitive with the earnings that could be received by reinvesting the money in the elevator. On the other hand, bank note financing will allow an elevator to give a customer credit at a low cost to the elevator and it has the added advantage of freeing more funds for reinvestment in the business. This increase in investment may tend to cause an increase in the growth rate.

The use of departmental cost accounting was also compared to the growth rate. It was anticipated that if the elevator used departmental cost accounting, the manager would be able to make more accurate decisions and the result would be an increase in growth. However, results of this test showed no significant relationship.

The Relationship Between the Means of Accounting and Growth

A chi-square test of independence was also used to determine if there is any relationship between the means of accounting and the growth rate. The five means of accounting analyzed were: 1) the manager doing it himself, 2) a part-time bookkeeper, 3) a full-time bookkeeper, 4) an accounting firm, and 5) a computerized accounting system. These were related to the rapidly growing, slowly growing, and declining elevators. The sample studied consisted of 146 elevators.

Table IV-3 shows the results of the test. With eight degrees of freedom, this test indicated no relationship between the means of accounting and the growth rate. Although no relationship was found, some observations can be made. Twice as many elevators with a declining growth rate had the manager do the accounting as compared to the rapidly growing elevators. Some reasons for this might be that elevators with a declining growth rate are smaller and have fewer employees, therefore the manager must do the accounting. This may have the advantage of keeping the manager well informed about his business, but it might consume too much of his time which could be spent with other management decisions.

Another observation made is that over twice as many of the rapidly growing elevators had accounting firms do their accounting as compared to the ones with a declining growth rate. To put this in numerical form, 35 of the rapidly growing elevators hired accounting firms while only seventeen of the declining elevators hired them. Some reasons for this might be that the rapidly growing elevators are larger and have enough volume to employ an accounting firm while this may not be true of the declining firms. Also, specialists in accounting may be able to provide special information on such things as tax considerations and various types of business analysis that can aid the manager in making decisions. The result may be a more rapid rate of growth.

Table IV-3

Number of South Dakota Elevators that Use the Various Means of Bookkeeping, 1968

Rate of Growth	Manager Does The Bookkeeping	Part-time Bookkeeper	Full-time Bookkeeper	Accounting Firm	Computerized Accounting System	Totals
Declining	10	5	11	17	5	48
Slowly Growing	5	1	6	25	3	40
Rapidly Growing	5	4	11	35	3	58
Totals	20	10	28	77	11	146

Computed Chi-Square = 12.130

Tabular Chi-Square = 15.507

Level of Significance = .05

Degrees of Freedom = 8

In the sample studied, 11 elevators used a computerized accounting system. These 11 elevators were evenly distributed between the declining, slowly growing, and rapidly growing elevators. Thus, there appears to be no relationship between having a computerized accounting system and the growth rate of an elevator.

CHAPTER V

TRANSPORTATION AND THE FUTURE OF SOUTH DAKOTA ELEVATORS

Introduction

The transportation system of South Dakota makes up an important part of the total effort to promote efficient and orderly grain marketing. Each year nearly 130 million bushels of grain are exported from this state. Much of this grain, nearly 85 million bushels, is shipped by rail. The remaining 45 million bushels are shipped by truck. Transportation expenses are a significant part of the total marketing expenses. In addition to the freight bill, transportation costs have an effect on the economic structure of the market and price relationships between producing areas, markets, and consuming areas.

It is the purpose of this chapter to analyze the effect of some aspects of the transportation system on the growth of elevators and then to discuss some of the opportunities for South Dakota elevators to reduce transportation costs.

Truck versus Rail

The two types of transportation available to South Dakota elevators are truck and rail. When the elevator managers were asked on the questionnaire if they would prefer to ship by truck or by rail at equal rates, the majority said they would prefer to ship by rail. One hundred ninety-three managers answered this question and

124 said they preferred to ship by rail while only 69 said they preferred to ship by truck. See Table V-1.

An analysis was made to determine if there is a relationship between the type of transportation system used and the growth rate of the elevator. Sixty elevators shipping 80 percent or more of their grain by either truck or rail were studied. A chi-square test of independence was used to test the relationship between growth and the method of shipping. Table V-2 gives the results of the test. No significant relationship was found. Thus, the method of transportation used, by itself, does not seem to affect the growth rate of an elevator.

The Impact of an Interstate Highway on the Growth of Grain Elevators

One important aspect in South Dakota's future transportation system will be interstate highways. Since the period under study is from 1963 to 1968, an analysis of the effect of interstate highways on grain elevators would not be meaningful because data are available for only a few elevators that were located on or near an interstate highway during that period. Thus, this section discusses the effect the interstate highway system may have on grain elevators based on the effect of interstate highways on other businesses.

When an elevator is located near an interstate highway, it may have the opportunity to ship more grain by truck. If an elevator could ship by either rail or truck, it may mean an increase in

Table V-1

Number of South Dakota Elevators that Prefer to Ship by Truck or Rail, 1968

Method of Shipment Preferred	Number of Elevators
Truck	69
Rail	124
Total	193

Table V-2

Number of South Dakota Elevators that Ship Mostly by Truck or Mostly by Rail, 1968

Growth Rate	Ship 80 Percent or More by Truck	Ship 80 Percent or More by Rail	Totals
Declining	7	12	19
Slowly Growing	6	8	14
Rapidly Growing	11	16	27
Totals	24	36	60

Computed Chi-Square = 0.131 Tabular Chi-Square = 5.991

Level of Significance = .05 Degrees of Freedom = 2

the competition between the two modes of transportation. The result may be more favorable transportation rates for the elevator.

An interstate highway may also be beneficial to an elevator during the winter months. The reason is that travel is usually possible on an interstate highway during winter days when it would be impossible on other highways. For elevators that sell large amounts of farm supplies, it may be important to be on a highway which can be traveled nearly every day. This would insure an adequate inventory of farm supplies regardless of the weather conditions. During the winter months many trucks will not travel on two-lane highways because of the higher probability of an accident and because the speed of travel is usually slower. During the spring months, the elevators located along interstate highways will not be affected by load limit restrictions and they can be assured of good service during this time of the year. This suggests that the businesses which depend on the service of trucks have an advantage if they are located along an interstate highway.

Another advantage of being located on or near an interstate highway is that many of these towns often develop into trade centers. The Economic Impact Study of South Dakota Highway 29 made by the Research and Planning Division of the South Dakota Department of Highways was completed for an area along Interstate 29 between Sioux Falls, South Dakota, and Sioux City, Iowa.

It was found that the study area as a whole was economically benefited by the addition of the Interstate Highway. Taxable retail

sales was the main barometer used to determine the changes that took place within the study area and it was found that the study area had a larger percentage increase during the years 1958 to 1965 than the State of South Dakota or the selected control area.[13]

This suggests that the elevators located along an interstate highway may have the opportunity to develop as farm supply and service centers because more people will come to those towns to do their business. The result of this may be that the elevators located near an interstate highway, like other businesses, may attract business from the surrounding areas. Elevators located in nearby towns but not on the interstate highway may be adversely affected, however.

The Relationship Between Hopper Cars and Growth

The use of large, 200,000 pound, hopper cars is relatively new in South Dakota. They have not been in use long enough to determine if there is a definite relationship between an elevator's using them and the growth of the elevator. However, a chi-square test of independence was used to determine if there is a relationship between having facilities for loading large, 200,000 pound, hopper cars and the growth rate.

Table V-3 shows the results of the test. With two degrees of freedom, there was a relationship between having facilities for

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[13]South Dakota Department of Highways, Economic Impact Study of South Dakota Interstate Highway 29, June 1967, p. 8-9.

Table V-3

The Number of South Dakota Elevators that Have Facilities For Loading Large Hopper Cars, 1968

Rate of Growth	Have the Facilities	Do Not Have the Facilities	Totals
Declining	14	35	49
Slowly Growing	15	32	47
Rapidly Growing	31	28	59
Totals	60	95	155

Computed Chi-Square = 7.79572 Tabular Chi-Square = 5.991

Level of Significance = .05 Degrees of Freedom = 2

loading large, 200,000 pound, hopper cars and the growth rate at the five percent level of significance. This suggests that elevators who have the ability to take advantage of the cost savings from large volume shipments are the ones that are likely to grow the fastest in the future.

Multiple-Car Shipments

In 1968 the Interstate Commerce Commission permitted the railroads to give elevators reduced rates for multiple-car units. This may have an effect on the size and location of elevators in the future and it may also decrease the total transportation cost of shipping South Dakota grain.

Table V-4 compares the costs in percent which the railroad incurs for both single car shipments and for five car shipments. There are several reasons for the difference in costs. Yarding expenses are reduced because five cars are switched at a time instead of one car. It takes less time to switch five cars when they are coupled than it does to switch five individual cars. This will usually decrease yard expenses by about one-third, lowering the percentage of total costs accounted for by this category from 30 percent down to 20 percent.[14]

The car expense can also be reduced, because with a five-car rate people seem to keep track of things more accurately. There

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[14] John Ingram, Proceedings of the Grain Marketing Sessions, Department of Agricultural Economics, University of Illinois, Urbana, January 31 and February 1, 1968, p. 14.

Table V-4

Approximate Mainline Costs of the Illinois Central Railroad, 1968[a]

Broad Cost Item	Single Car	Five-Car Shipment
	(percent)	
Yard	30	20
Car	25	20
Bookkeeping	5	2.5
Train Running		
Capacity	20	20
Use	20	20
Savings:	0	17.5
Total	100	100

[a]John Ingram, Proceedings of the Grain Marketing Sessions, Department of Agricultural Economics, University of Illinois, Urbana, January 31 and February 1, 1968, p. 14.

is better car utilization, the cars move more quickly, and there is a better record of car movement and location. In the same manner bookkeeping expense can be reduced. It does not cost much more to keep track of five cars than it does to keep track of one car, and bookkeeping costs can be cut in half, down to 2.5 percent of the total costs for single car shipments.[15]

The cost for maintaining and providing operating capacity and the cost of running trains will probably remain the same. Thus, the new cost for a five-car rate will be around 82.5 percent of the cost for single car shipments. This will be a savings of about 17.5 percent of the total cost, assuming that nothing else changes.[16]

Table V-5 shows the possible savings available to South Dakota elevators if all the wheat were shipped in five-car shipments. To arrive at this figure, South Dakota was divided into three areas; the western area, the northeast area, and the southeast area. The freight rates for three towns located in each area were averaged to give an average freight rate for each area. These rates are shown in Table V-5. The production for each of these areas was found. It was assumed that 96 percent of the wheat produced was shipped by rail.[17]

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[15] Ibid.

[16] Ibid.

[17] U. S. Department of Commerce and Bureau of the Census, 1964 United States Census of Agriculture, Vol. I, Part 19 (Washington, D. C.: U. S. Government Printing Office, 1967), p. 17.

Table V-5

Possible Savings for South Dakota Elevators from Multiple-Car Shipments, 1968

Location	Bushels of Wheat Marketed	Average Transportation Rate in Cents Per Bushel	Transportation Cost	Possible Savings
Western South Dakota	19,612,869	27.3	$ 5,354,313.24	$ 937,004.82
Southeastern South Dakota	1,710,680	19.2	$ 328,450.56	$ 57,478.85
Northeastern South Dakota	28,602,500	16.8	$ 4,805,220.00	$ 840,913.50
Totals	49,926,049		$10,487,983.80	$1,835,397.17

The amount of wheat shipped and the transportation rates were used in calculating the total transportation cost.

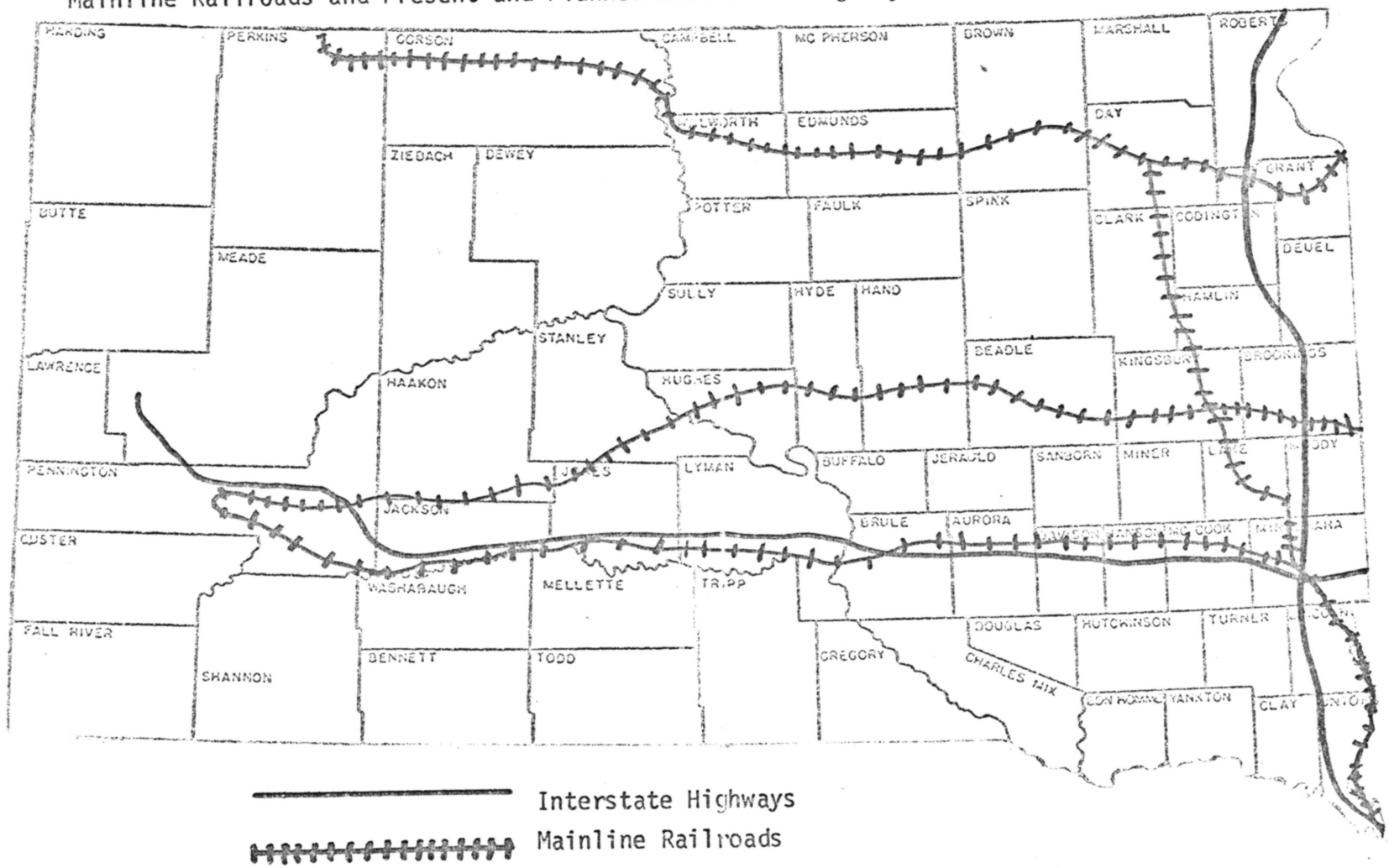
It was shown above that railroads could offer a 17.5 percent discount if grain were shipped by five-car shipments instead of by single car shipments. Thus, if all the wheat that is shipped from South Dakota were shipped in five-car units, the possible savings would be $1,835,397.17.

If most of the grain in South Dakota were shipped by multiple-car shipments, it may have a great effect on grain elevators. One result is that the elevators may be forced to become larger because only large elevators can use multiple-car shipments. The reason is that usually only large elevators have enough grain of the same kind to fill five cars. Another result of multiple-car shipments is that the total marketing cost may be decreased and both the elevators and the farmers may benefit.

Figure V-1 depicts the mainline railroads and both the present and planned interstate highway systems in South Dakota. Assuming that in the future elevators located along a mainline railroad and/or an interstate highway will be better able to avail themselves of lower transportation rates and volume shipments, then one could expect those elevators so situated to have a competitive advantage over other elevators not so situated. If this is true, then the transportation system shown in Figure V-1 gives an indication of where the large elevators of the future are likely to be located.

Figure V-1

Mainline Railroads and Present and Planned Interstate Highways for South Dakota, 1968



CHAPTER VI

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This study was undertaken to determine some of the characteristics which cause some elevators to grow and others to decline. The identification of such characteristics has important implications for grain elevator operators, farmers, and community leaders of small towns.

South Dakota is served by 450 elevators and they were first analyzed on the basis of their radius of business and the volume of grain they handle per year. When the radius of business for eighteen large elevators was averaged, it was found that the average radius was 32.4 miles. Based on this radius of business, it was found that South Dakota could be served by 34 elevators. North Dakota and Ohio studies indicated an elevator should handle at least one million bushels of grain annually if they want to achieve some minimum economies of scale. If all the elevators in South Dakota handled one million bushels only 150 elevators would be needed. Thus, it appears that South Dakota may have more elevators than is needed.

The growth rates for both the farm supply and service departments and the grain merchandising departments were analyzed. Many of the grain merchandising departments had a declining growth rate while a number of the farm supply and service departments had a rapidly growing rate of growth. This indicates that much of the growth in

grain elevators during the five year period studied was in the farm supply and service departments.

An analysis was also made to determine if there is a relationship between the types of goods and services sold and the growth of an elevator. Certain goods and services did show a positive relationship. In general, they tended to be of a technical nature such as fertilizer specialists, farm mapping, bulk fertilizer, and liquid feed.

Some conclusions that were derived from the overall results of these tests are that the rapidly growing elevators are often the first ones to introduce technical goods and services. Having one or more of these technical goods and services does not mean it will cause the elevator to grow rapidly, but rather the elevators which are innovators and have upgraded their product mix by including these technical goods and services tend to be the ones which are most likely to be rapidly growing.

The relationships between eleven variables were analyzed. The strong relationships shown were that the number of full-time employees is related to the storage capacity in bushels and to the net profit. Although other relationships existed, they were not as strong as these.

The next analysis was made to determine if there is a relationship between the growth rate of elevators and selected credit policies. No significant relationship was found between granting credit for thirty days and the growth rate. However, there was a slight negative relationship between granting credit for sixty days and the growth

rate. This weak relationship might indicate that those elevators that granted credit up to sixty days tend to be the ones that have a declining growth rate. Finally, the tests showed a strong negative relationship between granting credit for ninety days and the growth rate.

There may be several reasons for this outcome. Those elevators that are extending credit up to ninety days may have a large portion of their assets in the form of accounts receivable. When their assets are in this form, they may not be able to make the investments which are important for their business and this may result in a slower growth rate. Also, the uncollectable expense may be larger when credit is granted for a long period.

The relationship between growth and long-term financing was also analyzed. The two types were full season financing and bank note financing. No relationship was found between the offering of full season financing and the growth of an elevator, however, a very strong relationship between bank note financing and the growth rate was found.

Another operating policy analyzed was the means of accounting. No relationship was shown between the growth rate and the means of accounting. Although no relationship was found, some observations can be made. Twice as many elevators with a declining growth rate had the manager do the accounting as compared to the rapidly growing elevators. Another observation made is that over twice as many of the rapidly growing elevators had accounting firms do their accounting as

compared to the ones with a declining growth rate. Finally, 11 elevators used a computerized accounting system. These 11 elevators were evenly distributed between the declining, the slowly growing, and the rapidly growing elevators.

The next analysis tested the relationship between the growth rate of an elevator and the type of transportation system used. First, a test was made to see if shipping by truck or rail was related to growth. No relationship was found between these two variables.

Tests showed there is a relationship between the growth rate and elevators that have facilities for loading large, 200,000 pound, hopper cars. This may indicate that the elevators which have the ability to take advantage of the cost savings from large volume shipments are the ones that are likely to grow the fastest in the future. Also, those elevators situated along an interstate highway or a main-line railroad may be better able to avail themselves of lower transportation rates and large volume shipments. Thus, it appears that the transportation system has some effect on growth.

Implications

The conclusions of this study indicate that the elevators of South Dakota face many problems. They also suggest some things about the future of the industry. There is likely to be a continuation of the decline in the number of elevators as more mergers and consolidations occur. This will result in a larger average size of elevators as they attempt to reap economies of scale.

Those elevators which are likely to grow and be the leaders in the industry are those which keep careful watch on their product mix and upgrade the mix by readily adopting new products and services. Some elevators may decide to specialize in one or two technical goods or services and thus develop a large radius of business and maintain a profitable enterprise.

More consideration may be given to the type of financing elevators offer. More elevators of all sizes may find that they will be able to grant credit up to 30 days only and they will have to offer bank note financing for the remainder of the financing they do. This will provide more capital for investment in their business.

Need for Further Research

The opportunities for research on this subject are unlimited. More research should be done to determine logical areas for grain elevator and farm supply centers of the future. This study may provide the basis for determining these locations, but a more extensive evaluation of South Dakota's transportation system must be undertaken first. Also, the advantage of complete farm supply and service centers versus several small elevators each specializing in one or two goods and services should be analyzed.

An additional study of management techniques is also needed because it may be a direct aid to elevator managers. This could include such things as hedging, grading, and storing grain. Research could also be done to determine some alternative uses for excess grain storage capacity.

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APPENDIX A

CONFIDENTIAL

Farm Supply & Grain Elevator Questionnaire
South Dakota State University
Economics Department
Questionnaire No. ___

1. What is the present capacity of your grain elevator excluding subsidiaries? _____Bushels

2. How many bushels of the following grains did you purchase during your most recent fiscal year?

Wheat	_____Bushels	Oats	_____Bushels
Corn	_____Bushels	Barley	_____Bushels
Soybeans	_____Bushels	Rye	_____Bushels
Flax	_____Bushels	Others	_____Bushels

3. What was the approximate radius of your business five years ago? _____miles. What is the current radius? _____ miles. What do you expect the radius to be five years from now? _____miles.

4. What is the total gross volume in dollars of grain purchased during your most recent fiscal year? _____dollars. What was this amount five years ago? _____dollars.

5. What is the total gross volume in dollars of farm supplies and services sold during your most recent fiscal year? _____ dollars. What was this amount five years ago? _____dollars.

6. What was your net profit during your last fiscal year? _____

7. Do you have facilities for loading large (200,000 pound) hopper cars? YES NO

8. How many full-time employees do you have? _____

9. How many part-time employees do you have? _____

10. Please check the appropriate box if you offered these services five years ago, currently offer them, or plan to offer them during the next five years. For example, if you offered a service five years ago, currently offer it, and plan to offer it during the next five years, check all three boxes. If you are uncertain, put a question mark in the box.

	Five years ago	Currently	During the next five years
Seed cleaning (coarse grains)			
Seed cleaning (fine seeds)			
Seed treating (coarse grains)			
Seed treating (fine seeds)			
Soybean inoculation			
Feed grinding			
Feed mixing			
Bulk feed delivery			
Mobile mills			
Grain and general trucking			
Livestock trucking			
Semi-trailer and long distance hauling			
Feed specialists			
Soil specialists			
Fertilizer specialists			
Chemical specialists			
Soil testing			
Farm mapping			
Custom crop spraying			
Custom livestock spraying			
Custom bin spraying			
Crop sprayers for rent			
On the farm service calls for tires, batteries and accessories			
Water system service			
Custom repair of any farm machinery			

	Five years ago	Currently	During the next five years
Employ full-time carpenters . .			
Custom painting service. . . .			
Record keeping for customers on all (cash and charge) purchases and sales . . .			
Provide performance record-keeping for livestock and fertilizer			
Radio dispatched trucks			
Twine or rope			
Other services offered--please list			

11. Farm Supplies Offered

Please check the appropriate box if you handled these farm supplies five years ago, currently offer them, or plan to offer them during the next five years. For example, if you offered them five years ago, currently offer them, and plan to offer them during the next five years, check all three boxes. If you are uncertain, put a question mark in the box.

	Five years ago	Currently	During the next five years
Fertilizer--bagged			
Fertilizer--bulk			
Fertilizer--liquid.			
Fertilizer--anhydrous			
Feed--bagged			
Feed--liquid			
Feed--bulk.			
Ag chemicals (weed sprays) .			
Petroleum--bulk plant			
Petroleum--retail station. . .			
Diesel fuel.			
Propane gas			

	Five years ago	Currently	During the next five years
Tires, batteries, and accessories			
Hardware goods, fencing, etc.			
Wagons			
Grain drying systems			
Grain bins			
Water systems			
Softener salts			
Self feeders or feed bunks for any type of livestock			
Lumber			
Irrigation equipment			
Artificial insemination semen or service			
Lawn and garden supplies			
Paint			
Other farm supplies--please list			

12. Operating Policies

Check the appropriate box if your firm carried on these operating policies five years ago, currently carries them on, or plans to institute them during the next five years. If you are uncertain, put a question mark in the box.

	Five years ago	Currently	During the next five years
No credit granted			
Credit granted up to 30 days			
Credit granted up to 60 days			
Credit granted up to 90 days			
Interest or service charge for accounts of 30 days or less			
Interest or service charge for accounts of more than 30 days			

	Five years ago	Currently	During the next five years
Offer bank note financing . . .			
Offer full season financing . .			
Determine net profit or loss by department.			
Other operating policies--please list			

13. What percent of your grain do you ship by rail? _____%

What percent of your grain do you ship by truck? _____%

What percent of your grain do you sell locally? _____%

14. At equal freight rates would you prefer to ship by:

rail truck
(circle one)

15. What is your freight rate to Minneapolis for the following grains?

Rail		Truck	
Wheat	cwt.	Wheat	cwt.
Corn	cwt.	Corn	cwt.
Soybeans	cwt.	Soybeans	cwt.
Flax	cwt.	Flax	cwt.
Oats	cwt.	Oats	cwt.
Barley	cwt.	Barley	cwt.
Rye	cwt.	Rye	cwt.

16. What is your freight rate to Sioux City for the following grains?

Rail		Truck	
Wheat	cwt.	Wheat	cwt.
Corn	cwt.	Corn	cwt.
Soybeans	cwt.	Soybeans	cwt.
Flax	cwt.	Flax	cwt.
Oats	cwt.	Oats	cwt.
Barley	cwt.	Barley	cwt.
Rye	cwt.	Rye	cwt.

17. What is your freight rate to Duluth for the following grains?

Rail		Truck	
Wheat	cwt.	Wheat	cwt.
Corn	cwt.	Corn	cwt.
Soybeans	cwt.	Soybeans	cwt.
Flax	cwt.	Flax	cwt.
Oats	cwt.	Oats	cwt.
Barley	cwt.	Barley	cwt.
Rye	cwt.	Rye	cwt.

18. Would your business be materially affected if you had no rail service? YES NO
(circle one)

19. Who does your accounting? (Please check one)

_____1. Yourself

_____2. Part-time bookkeeper

_____3. Full-time bookkeeper

_____4. Accounting firm--specify who_____.

_____5. Computerized accounting system

20. Would you like a copy of this study when it is completed?

YES NO

21. What in your opinion are the major problems facing the elevator and farm supply industry today?